

CLAIMS

1. An air-conditioning garment comprising:
air guiding means for covering a predetermined part
of a body and guiding air along a surface of the body or an
undergarment in a space between itself and the body or the
undergarment;
one or a plurality of air circulating portions which
take air flowing in the space between the air guiding means
and the body or the undergarment to the outside or take
outside air into the space between the air guiding means
and the body or the undergarment;
one or a plurality of air sending means for forcibly
generating a flow of air in the space between the air
guiding means and the body or the undergarment; and
power supplying means for supplying power to the air
sending means,
wherein the air sending means generates air flowing
with a flow quantity of at least 0.01 liter/second per kg
of a weight of a wearer, and the air sending means
circulates air in the space between the air guiding means
and the body or the undergarment to facilitate vaporization
of sweat generated from the body and expand a range in
which a physiological cooler function originally included
in a human body is effectively exercised.

2. An air-conditioning garment comprising:

air guiding means for covering a predetermined part of a body and guiding air along a surface of the body or an undergarment in a space between itself and the body or the undergarment;

one or a plurality of air circulating portions which take air flowing in the space between the air guiding means and the body or the undergarment to the outside or take outside air into the space between the air guiding means and the body or the undergarment;

one or a plurality of air sending means for forcibly generating a flow of air in the space between the air guiding means and the body or the undergarment; and

power supplying means for supplying power to the air sending means,

wherein the air sending means circulates air in the space between the air guiding means and the body or the undergarment to facilitate vaporization of sweat generated from the body and expand a range in which a physiological cooler function originally included in a human body is effectively exercised, and the air-conditioning garment has such an air-conditioning capability as vaporization heat drawn from the periphery by the sweat generated from the body is at least 340 calories/hour per kg of a weight of a wearer when outside air has a temperature of 33° and humidity of 50 %.

3. An air-conditioning garment comprising:

air guiding means for covering a predetermined part of a body and guiding air along a surface of the body or an undergarment in a space between itself and the body or the undergarment;

one or a plurality of air circulating portions which take air flowing in the space between the air guiding means and the body or the undergarment to the outside;

one or a plurality of air sending means for taking outside air into the space between the air guiding means and the body or the undergarment and forcibly generating a flow of air in the space between the air guiding means and the body or the undergarment; and

power supplying means for supplying power to the air sending means,

wherein the air sending means generates air flowing with a flow quantity of at least 2 liters/second, and the air sending means circulates air in the space between the air guiding means and the body or the undergarment to facilitate vaporization of sweat generated from the body and expand a range in which a physiological cooler function originally included in a human body is effectively exercised.

4. An air-conditioning garment comprising:

air guiding means for covering a predetermined part of a body and guiding air along a surface of the body or an undergarment in a space between itself and the body or the

undergarment;

one or a plurality of air circulating portions which take air flowing in the space between the air guiding means and the body or the undergarment to the outside or take outside air into the space between the air guiding means and the body or the undergarment;

at least two air sending means for forcibly generating a flow of air in the space between the air guiding means and the body or the undergarment; and

power supplying means for supplying power to the air sending means,

wherein the air sending means is attached at a part close to a rib in a lower portion of the air guiding means on a back side and generates air flowing with a flow quantity of at least 0.01 liter/second per kg of a weight of a wearer, and the air sending means circulates air in the space between the air guiding means and the body or the undergarment to facilitate vaporization of sweat generated from the body and expand a range in which a physiological cooler function originally included in a human body is effectively exercised.

5. An air-conditioning garment comprising:

air guiding means for covering a predetermined part of a body and guiding air along a surface of the body or an undergarment in a space between itself and the body or the undergarment;

one or a plurality of air circulating portions which take air flowing in the space between the air guiding means and the body or the undergarment to the outside;

one or a plurality of air sending means for taking outside air into the space between the air guiding means and the body or the undergarment and forcibly generating a flow of air in the space between the air guiding means and the body or the undergarment; and

power supplying means for supplying power to the air sending means,

wherein the air sending means is attached at a back portion of the air guiding means and generates air flowing with a flow quantity of at least 10 liters/second, and the air sending means circulates air in the space between the air guiding means and the body or the undergarment to facilitate vaporization of sweat generated from the body and expand a range in which a physiological cooler function originally included in a human body is effectively exercised.

6. An air-conditioning garment which is put on under an overgarment, comprising:

air guiding means for covering a predetermined part of a body and guiding air along a surface of the body or an undergarment in a space between itself and the body or the undergarment;

one or a plurality of air circulating portions which

take air flowing in the space between the air guiding means and the body or the undergarment to the outside or take outside air into the space between the air guiding means and the body or the undergarment;

one or a plurality of air sending means for forcibly generating a flow of air in the space between the air guiding means and the body or the undergarment; and

power supplying means for supplying power to the air sending means,

wherein the air sending means generates air flowing with a flow quantity of at least 0.01 liter/second per kg of a weight of a wearer, a maximum static pressure of the air sending means is at least 30 pascals, and a temperature gradient in the vicinity of the surface of the body is increased to cool the body, sweat generated from the body is vaporized and vaporization heat drawn from the periphery by the sweat at the time of vaporization is utilized to cool the body when the air sending means circulates air in the space between the air guiding means and the body or the undergarment.

7. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein the air guiding means has such air permeability as a ratio of a flow quantity of air leaking from the entire air guiding means to the outside with respect to a flow quantity of air taken into the space between the air guiding means and the body or the

undergarment is at most 60 %.

8. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein a ratio of a surface area of a part of the body wrapped with air generated by the air sending means with respect to a surface area of the entire body is at least approximately 10 %.

9. The air-conditioning garment according to claim 1, 2, 3, 4 or 5, wherein a local spacer which locally assures a space which allows circulation of air between the air guiding means and the body or the undergarment is provided at a predetermined position on an inner surface side of the air guiding means.

10. The air-conditioning garment according to claim 1, 2, 3, 4 or 5, wherein the air sending means is a side stream fan which radially sends air taken in from an axial direction of an impeller toward an outer peripheral direction of the impeller, and attached at a predetermined position on the inner surface side of the air guiding means.

11. The air-conditioning garment according to claim 1, 2, 3, 4 or 5, wherein the air sending means has a propeller, and direction converting means for converting a flow direction of air in such a manner that air taken in from the propeller along a rotation axis direction of the

propeller flows radially toward a direction substantially orthogonal to the rotation axis direction of the propeller.

12. The air-conditioning garment according to claim 1, 2, 4 or 6, wherein the air sending means discharges air flowing between the air guiding means and the body or the undergarment to the outside and generates air flowing with a flow quantity of at most 6 liters/second, and a planar spacer which assures a space which allows circulation of air between the air guiding means and the body or the undergarment is provided at a predetermined part on the inner surface of the air guiding means.

13. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein the air sending means is attached on the inner surface side of the air guiding means.

14. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein the air circulating portion is an opening portion formed at a predetermined end portion of the air guiding means.

15. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein a part formed out of a cloth having high air permeability in a clothing material which covers a predetermined part of the body is utilized as the air circulating portion.

16. The air-conditioning garment according to claim 15, wherein the entire clothing material is manufactured by using a cloth having high air permeability, a part on which a sheet-like member having low air permeability is laminated from an inner side of the clothing material in the clothing material is utilized as the air guiding means, and a part on which no sheet-like member is laminated in the clothing material is utilized as the air circulating portion.

17. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein a hole is formed at a predetermined position of the air guiding means, and a material having excellent air permeability is attached on the air guiding means to close the hole, thereby forming the air circulating portion.

18. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein there is provided opening/closing means for opening/closing a front part of the air guiding means and preventing air from leaking to the outside from the front part when the front part of the air guiding means is closed.

19. The air-conditioning garment according to claim 18, wherein the opening/closing means is a fastener or a

Velcro tape.

20. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein buttons are used as opening/closing means for opening/closing a front part of the air guiding means, and an extending portion which increases an area of an overlapping portion of the air guiding means generated when the buttons are fastened is provided at an end portion of the air guiding means on a side where the buttons are attached.

21. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein air leak preventing means for preventing air from leaking to the outside from a hem portion of the air guiding means by bringing the hem portion into close contact with the body, the undergarment or a garment is provided at the hem portion.

22. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein the air guiding means has such a length as a lower portion of the air guiding means is enabled to cover buttocks and a lower abdominal region of a wearer.

23. The air-conditioning garment according to claim 1, 2, 3, 4 or 5, comprising air leak preventing means having a band-like clothing material which is stitched at a

position in the vicinity of a hem portion of the air guiding means on the inner surface side of the air guiding means along a direction around a waist and an elastic member which is put into an end portion of the band-like clothing material on the body side, wherein the air leak preventing means prevents air from leaking to the outside from the hem portion of the air guiding means when the end portion of the band-like clothing material in which the elastic member is put is appressed against the body, the undergarment or a garment.

24. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein a material which air does not substantially permeate is used as a material of the air guiding means.

25. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein a material containing 100 % of polyester or a mixed material containing 80 % or more of polyester is used as a material of the air guiding means.

26. The air-conditioning garment according to claim 1, 2, 3, 4 or 5, wherein a material which does not absorb rain water is used as a material of the air guiding means.

27. The air-conditioning garment according to claim 1, 2, 3, 4 or 5, wherein the air guiding means is subjected

to waterproof processing or water-repellent processing.

28. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein air agitating means for forcibly disturbing a flow of air in the space between the air guiding means and the body or the undergarment is provided on the inner surface of the air guiding means.

29. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein flow path setting means for forcibly setting a path through which air flows in the space between the air guiding means and the body or the undergarment is provided on the inner surface of the air guiding means.

30. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein accommodating means for accommodating the power supplying means is attached on the inner surface side of the air guiding means at a position corresponding to a pocket provided on an outer surface side of the air guiding means.

31. The air-conditioning garment according to claim 1, 2, 3, 4 or 5, wherein a secondary battery is used as the power supplying means, and a solar battery is used to charge the secondary battery.

32. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein a fuel battery is used as the power supplying means.

33. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein a capacitor is used as the power supplying means.

34. The air-conditioning garment according to claim 1, 2, 3, 4 or 5, wherein the power supplying means is a commercial power source, DC converting means is used to convert an alternating voltage from the commercial power source into a direct-current voltage, and the converted direct-current voltage is supplied to the air sending means.

35. The air-conditioning garment according to claim 1, 2, 3, 4 or 5, wherein the air guiding means is formed into a shape which covers an upper body and a head region excluding a face.

36. The air-conditioning garment according to claim 1, 2, 3, 4 or 5, wherein the air guiding means is formed into a shape which covers an upper body and a lower body.

37. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein a spacer which assures a space which allows circulation of air between the air guiding

means and the body or the undergarment is provided at a position corresponding to a lumbar region on the inner surface side of the air guiding means.

38. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein a spacer which assures a space which allows circulation of air between the air guiding means and the body or the undergarment is provided at a part corresponding to a back region on the inner surface side of the air guiding means.

39. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein at least the 10 air sending means each having a thickness of at most 6 mm are provided at predetermined positions of the air guiding means.

40. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, comprising a band-like member to which the air sending means and the power supplying means are attached, wherein the air guiding means comprises upper air guiding means for covering an upper part of an upper body and a lower air guiding means for covering a lower part of the upper body, a lower end of the upper air guiding means is detachably disposed to an upper end of the band-like member, and an upper end of the lower air guiding means is detachably disposed to a lower end of the band-like member.

41. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein the air sending means is detachably disposed at a predetermined position of the air guiding means.

42. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, comprising a band-like member to which the air sending means is attached, wherein the band-like member is detachably disposed at a predetermined position on the inner surface side of the air guiding means.

43. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein the air guiding means is configured to be divided into two parts, i.e., upper and lower parts, and the air sending means is attached to the lower part of the air guiding means.

44. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, comprising a band-like member to which the air sending means is attached, wherein the band-like member is detachably disposed at a position corresponding to a lumbar region on the inner surface side of the air guiding means.

45. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, comprising remote control transmitting means for transmitting a signal which instructs to turn

on/off the air sending means, wherein the air sending means is provided with the power supplying means, receiving means for receiving the signal from the remote control transmitting means and controlling means for controlling driving of the air sending means based on the signal received by the receiving means.

46. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, comprising:

body temperature detecting means for detecting a body temperature of a wearer or work volume detecting means for detecting a work volume in accordance with movements of the wearer;

calculating means for calculating a flow quantity of air circulated in the space between the air guiding means and the body or the undergarment which is required for a human body to perform appropriate heat radiation in accordance with a situation at the time based on a detection result obtained by the body temperature detecting means or the work volume detecting means; and

drive controlling means for determining drive conditions of the air sending means based on the flow quantity of air calculated by the calculating means, and controlling driving of the air sending means in accordance with the determined drive conditions of the air sending means.

47. The air-conditioning garment according to claim 46, wherein DC-DC converting means capable of changing an output voltage is provided between the power supplying means and the air sending means, and the drive controlling means controls the DC-DC converting means to change a quantity of power supplied to the air sending means, thereby controlling driving of the air sending means.

48. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, comprising:

physical condition detecting means for detecting a physical condition of a wearer;
calculating means for generating information concerning the physical condition based on a detection result obtained by the physical condition detecting means; and

communicating means for transmitting to external receiving means the information concerning the physical condition transmitted from the calculating means.

49. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, comprising: inputting means; communicating means which is connected to the Internet to perform communication; controlling means for controlling the communicating means; and outputting means for outputting information downloaded through the Internet.

50. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein one having water-resisting properties is used as a cable which supplies electric power from the power supplying means, and the cable is attached on the inner surface of the air guiding means.

51. The air-conditioning garment according to claim 5, wherein the air sending means is a side stream fan which radially sends air taken in from an axial direction of an impeller toward an outer peripheral direction of the impeller, a diameter of the impeller is at least 60 mm, a flow quantity of air generated between the air guiding means and the body or the undergarment is at least 15 liters/second, and the one air sending means is provided at a part corresponding to a back region of the air guiding means.

52. The air-conditioning garment according to claim 51, comprising slinging means for carrying the air sending means on a wearer's back.

53. The air-conditioning garment according to claim 1, 2, 3, 4 or 5, wherein, when outside air has a temperature of 33 °C and humidity of 50 % and a flow quantity of air generated in the space between the air guiding means and the body or the undergarment is at least 5 liters/second, a ratio of an air-conditioning capability

with respect to a power consumption of the air sending means is at least 50-fold.

54. The air-conditioning garment according to claim 1, 2, 3, 4 or 5, wherein, assuming that a flow quantity of air generated in the space between the air guiding means and the body or the undergarment is L liters/second, means having such air sending pressure characteristics as a maximum static pressure falls within a range of $5 \cdot L^{1/2}$ pascals to $50 \cdot L^{1/2}$ pascals is used as the air sending means.

55. The air-conditioning garment according to claim 1, 2, 3, 4 or 5, wherein, assuming that a flow quantity of air generated in the space between the air guiding means and the body or the undergarment is L liters/second, a total cross-sectional area of the air circulating portions falls within a range of $5 \cdot L^{1/2} \text{ cm}^2$ to $20 \cdot L^{1/2} \text{ cm}^2$.

56. The air-conditioning garment according to claim 1, 2, 3, 4 or 5, wherein a ratio of a total effective cross-sectional area of the air circulating portions with respect to a total effective cross-sectional area of the air sending means is at least 0.7-fold.

57. The air-conditioning garment according to claim 1, 2, 3, 4, 5 or 6, wherein, when a pressure difference between a pressure in the air guiding means and an external

pressure is 10 pascals, a flow quantity of air leaking per cm² of the air guiding means in one second is at most 5 cc.